

Table 1. NIAGARA RIVER TOXICS MANAGEMENT PLAN EIGHTEEN PRIORITY TOXIC CHEMICALS
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Chlordane	PCBs*
Mirex/Photomirex*	Dioxin (2,3,7,8-TCDD)*
Dieldrin	Octachlorostyrene
Hexachlorobenzene*	Tetrachloroethylene*
DDT & metabolites	Benz(a)anthracene*
Toxaphene	Benzo(a)pyrene*
Mercury*	Benzo(b)fluoranthene*
Arsenic	Benzo(k)fluoranthene*
Lead	Chrysene/Triphenylene

* Chemicals designated for 50% reduction by 1996.

Table 2 Percent Change in Concentrations and Loads of Upstream/Downstream Program Chemicals between the Base Year and 1996/97

Chemical	Period of record	Fort Erie				Niagara-on-the-Lake			
		Concentration % change		Load % change		Concentration % change		Load % change	
		Dissolved	Susp. Part.	Dissolved	Susp. Part.	Dissolved	Susp. Part.	Dissolved	Susp. Part.
Chlorobenzenes									
Hexachlorobenzene	1986-1997	--	--	--	--	-69.6	-51.0	-67.3	-63.5
Chlorinated Pesticides & PCBS									
a-chlordane	1986-1997	--	NS	--	NS	NS	NS	NS	NS
g-chlordane	1986-1997	--	--	--	--	--	--	--	--
p,p'-DDT	1986-1997	--	-42.1	--	-75.6	--	-35.2	--	-51.8
o,p'-DDT	1986-1997	--	--	--	--	--	--	--	--
p,p'-TDE	1986-1997	-25.5	NS	-33.6	NS	NS	-29.1	NS	-47.3
p,p'-DDE	1986-1997	NS	-25.3	NS	-68.5	NS	-23.2	NS	-42.8
Dieldrin	1986-1997	-58.6	-38.2	-63.1	-74.0	-56.5	-60.1	-61.5	-70.3
Mirex	1986-1997	--	--	--	--	--	-49.6	--	-62.5
PCBs	1986-1997	-58.5	-59.5	-63.1	-82.9	-59.0	-75.5	-63.6	-81.8
PAHs									
Benz(a)anthracene	1986-1997	-59.1	-17.7	-63.6	-65.3	-40.8	-33.8	-47.5	-50.7
Benzo(a)pyrene	1988-1997	--	+81.1	--	+7.1	--	NS	--	NS
Benzo(b/k)fluoranthene	1986-1997	NS	NS	NS	NS	NS	NS	NS	NS
Chrysene-triphenylene	1986-1997	-30.6	NS	-38.2	NS	NS	-22.0	NS	-41.9
Industrial By-products									
Octachlorostyrene	1989-1997	--	--	--	--	--	-89.6	--	-84.0
Trace Metals in Whole Water		Whole Water Concentration % Change		Whole Water Load % Change		Whole Water Concentration % Change		Whole Water Load % Change	
Lead	1986-1997	-84.4		-86.2		-68.9		-72.4	
Arsenic	1986-1997	-3.1		-14.3		NS		NS	
Mercury	1986-1997	-83.6*		-85.5*		--		--	

Notes:

- * Raw data shows a decreasing trend, although caution must be exercised since early mercury data considered unreliable due to the likelihood of contamination.
- NS No significant trend was detected by the model for the period of record.
- Too few values above the detection limit to run the model.

**Table 3. LAKE ONTARIO LAKEWIDE MANAGEMENT PLAN
CRITICAL POLLUTANTS**

Chemical Name	Causes Lakewide Beneficial Use Impairments¹	Likely to Cause Lakewide Beneficial Use Impairments²	Loading entering Lake from Niagara River³
PCBs	•		•
DDT/ metabolites	•		•
Mirex	•		•
Dieldrin		•	•
Dioxins	•		NE
Mercury		•	NE

1 Based on direct evidence that the chemical is causing lakewide use impairments.

2 Based on “indirect” evidence that the chemical is causing lakewide beneficial use impairments because the chemical exceeds the most stringent government standard, criteria, or guideline.

3 Based on Upstream/Downstream Monitoring Program, 1992/1993.

NE = Not estimated, because concentrations were below the analytical detection limit.

Table 4 Surface Water Quality Criteria for Niagara River Toxics Management Plan “Priority Toxics and Lake Ontario LaMP Critical Pollutants (ppb)

Substance ^a	Protection of Human Health for Consumption of Fish			Protection of Aquatic Life (Acute Values)		Protection of Aquatic Life (Chronic Values) ^b				Protection of Human Health for Drinking Water Source			Protection of Piscivorous Wildlife
	NYS	EPA ^c	HC	NYS	EPA	NYS	EPA	OMOE ^b	IJC	NYS	HC	IJC	NYS
Arsenic		0.018		340^d	340 ^d	150^d	150 ^d	5(p)		50	50	50	
Benz(a)anthracene		0.0044		0.23		0.03		0.0004(p)		0.002			
Benzo(a)pyrene	0.0012	0.0044								0.002			
Benzo(b)fluoranthene		0.0044								0.002			
Benzo(k)fluoranthene		0.0044						0.0002(p)		0.002			
Chrysene		0.0044						0.0001(p)		0.002			
Chlordane	2E-5	2.1E-3	0.006		2.4		0.0043	0.06	0.06	0.05			
<i>p,p'</i> -DDD	8E-5	8.3E-4	see DDT					see DDT	see DDT	0.3			see DDT
<i>p,p'</i> -DDE	7E-6	5.9E-4	see DDT					see DDT	see DDT	0.2			see DDT
<i>p,p'</i> -DDT	1E-5	5.9E-4	0.001 ^e		1.1		0.001	0.003 ^e	0.003 ^e	0.2			1.1E-5^e
<i>Dieldrin</i>	6E-7^f	1.4E-4	0.004 ^f	0.24	0.24	0.056	0.056	0.001 ^f	0.001 ^f	0.004			
<i>Dioxins/dibenzofurans</i>	6E-10^g	1.3E-8 ^h						2E-8(p) ^g		7E-7^g			3.1E-9^h
Hexachlorobenzene	3E-5	7.5E-4	0.0065					0.0065		0.04			
Lead				see below^{i, d}	65 ^{j, d}	see below^{i, d}	2.5 ^{j, d}	5(p) ⁱ	25	50	2		
<i>Mercury</i>	7E-4^d	0.050		1.4^d	1.4 ^d	0.77^d	0.77 ^d	0.2 ^d	0.2 ^d	0.7	0.1 ^k		0.0026^d
<i>Mirex</i>	1E-6			0.001		0.001	0.001	0.001		0.03			
Octachlorostyrene	6E-6									0.2			
<i>PCBs^l</i>	1E-6	1.7E-4	0.001				0.014	0.001		0.09			1.2E-4
Tetrachloroethylene	1	0.8						50		0.7			

Table 4 Surface Water Quality Criteria for Niagara River Toxics Management Plan “Priority Toxics and Lake Ontario LaMP Critical Pollutants (ppb)

Substance ^a	Protection of Human Health for Consumption of Fish			Protection of Aquatic Life (Acute Values)		Protection of Aquatic Life (Chronic Values) ^b				Protection of Human Health for Drinking Water Source			Protection of Piscivorous Wildlife
	NYS	EPA ^c	HC	NYS	EPA	NYS	EPA	OMOE ^b	IJC	NYS	HC	IJC	NYS
Toxaphene	6E-6	7.3E-4		1.6	0.73	0.005	0.0002	0.008	0.008	0.06			

(New York State Standards are shown in boldface type)

Sources:

NY State: Division of Water Technical and Operational Guidance Series (1.1.1), June 1998. New York State Department of Environmental Conservation, Albany, NY.

U.S. EPA: National Recommended Water Quality Criteria. Office of Science and Technology, Washington, DC. May 21, 1999.

Ontario MOE: (1) Water Management Policies, Guidelines, Provincial Water Quality Objectives. July 1994. (2) Joint Evaluation of the Upstream/Downstream Monitoring Program, 1996-1997.

Health Canada: Joint Evaluation of the Upstream/Downstream Monitoring Program, 1996-1997.

IJC: (1) Specific Objectives. Annex 1 of the Great Lakes Water Quality Agreement of 1978, as amended 1987.

Footnotes:

- a. All substances shown are NRTMP “priority toxics”. Those in italics are also Lake Ontario LaMP critical pollutants.
- b. Concentrations designed to be protective of all aquatic life in situations of long-term exposure. For Ontario, values shown are Provincial Water Quality Objectives, or proposed PWQOs, denoted with (p).
- c. Values for protection of human health for consumption of water + organisms.
- d. Applies to dissolved form.
- e. Applies to sum of pp-TDE, ppDDE and ppDDT
- f. NY State Standard shown applies to dieldrin only. In addition, a NY State standard of 0.001 ppb applies to the sum of aldrin + dieldrin. Ontario PWQO, Health Canada, and IJC objectives apply to the sum of aldrin + dieldrin.
- g. Value is for total dioxins/furans as 2,3,7,8 equivalents.
- h. Applies only to 2,3,7,8-TCDD
- i. Chronic value in ppb = $\{1.46203 - [\ln(\text{hardness in ppm}) (0.145712)]\} \exp(1.273[\ln(\text{hardness in ppm})] - 4.297)$.
Acute value in ppb = $\{1.46203 - [\ln(\text{hardness in ppm}) (0.145712)]\} \exp(1.273[\ln(\text{hardness in ppm})] - 1.052)$.
- j. Hardness based criteria. For EPA criterion, 100 mg/L used. Ontario criteria apply at hardness > 80 mg/L.
- k. Applies to inorganic mercury.
- l. Values apply to sum of PCBs.

Table 5 New York State Advisories on the Consumption of Sportfish for Waters of the Niagara River and U.S. Tributaries (NYSDOH, 1998)

Water	Species	Recommendations	Chemicals of Concern
Niagara River, above Niagara Falls	Carp	Eat no more than one meal per month	PCBs
Niagara River, below Niagara Falls	White perch, American eel, channel catfish, carp, lake trout over 25", brown trout over 20", chinook salmon	Eat none	PCBs, Mirex, Dioxin
Tonawanda Creek, Lockport to Niagara River	Carp	Eat no more than one meal per month	PCBs
Buffalo River/Harbor	Carp	Eat none	PCBs
Cayuga Creek	All species	Eat none	Dioxin
Gill Creek, mouth to Hyde Park Lake Dam	All species	Eat none	PCBs, Dioxin

Note the additional general advisories, applicable to the Niagara River and U.S. tributaries, recommended by NYSDOH to minimize potential adverse health impacts:

- Eat no more than one meal (one-half pound) per week of fish from New York State fresh waters.
- Women of childbearing age, infants, and children under the age of 15 should not eat any fish species from the waters listed above.
- Follow trimming and cooking advice described in NYSDOH (1998).
- Observe the above restrictions from these waters and their tributaries to the first barrier impassable by fish.

Table 6



Ontario Ministry of the Environment: Selected Excerpts from the 1999/2000 Guide to Eating Ontario Sport Fish

CONSUMPTION ADVICE SYMBOLS TABLE		LOCATION	SPECIES	FISH SIZE IN CENTIMETRES (INCHES)									
Fish Symbol	Consumption Advice			15-20 (6-8)	20-25 (8-10)	25-30 (10-12)	30-35 (12-14)	35-45 (14-18)	45-55 (18-22)	55-65 (22-26)	65-75 (26-30)	>75 (30)	
	consumption up to eight meals/month*	Upper Niagara River	Rainbow Trout ⁵										
④	consumption restricted to four meals/month		Northern Pike ²										
②	consumption restricted to two meals/month		Smallmouth Bass ^{5,7}					④					
①	consumption restricted to one meal/month		Largemouth Bass ²										
	no consumption advised		Yellow Perch ⁵										
			White Bass ⁵	④									
			Rock Bass ⁵										
			Brown Bullhead ^{2,7}										
			Carp ^{2,7}							②	②	②	
			Freshwater Drum ^{5,7}										
			White Sucker ⁵										
			Redhorse Sucker ¹							④			
			Rainbow Smelt ²	④									
*Women of childbearing age and children under 15 are advised to consume only fish from the category and not to consume more than four meals/month of these fish													
A meal is considered to be 227 grams (8 oz.).													
Contaminants analysed													
The number beside the fish species name identifies the contaminant or group of contaminants for which the fish was tested:													
1 Mercury		Lower Niagara River	Chinook ⁵						②	②	②	①	
2 Mercury, PCBs, mirex/photomirex and pesticides			Rainbow Trout ^{5,7,8,9}							④	④	④	
3 PCBs, mirex/photomirex and pesticides			Lake Trout ⁵							①	①	①	
4 Mercury, PCBs and mirex			Smallmouth Bass ^{5,7}			④	④	②					
5 Mercury, other metals, PCBs, mirex/photomirex and pesticides			Largemouth Bass ²										
6 Mercury and other metals			Yellow Perch ^{5,7}			④	④						
7 Dioxins and furans			White Perch ²		②	①							
8 Mercury, PCBs, mirex/photomirex, pesticides, chlorinated phenols and chlorinated benzenes			White Bass ⁵			④	②						
9 Polynuclear aromatic hydrocarbons (PAHs)			Rock Bass ^{2,7}										
			Brown Bullhead ^{2,7}					④					
			Channel Catfish ⁵					④	②	②	②		
			Freshwater Drum ^{5,7}					④					
			Carp ^{2,7}						④	②	①		
		White Sucker ⁵					④	④					

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Contaminants analysed

The number beside the fish species name identifies the contaminant or group of contaminants for which the fish was tested:

- ¹ Mercury
- ² Mercury, PCBs, mirex/photomirex and pesticides
- ³ PCBs, mirex/photomirex and pesticides
- ⁴ Mercury, PCBs and mirex
- ⁵ Mercury, other metals, PCBs, mirex/photomirex and pesticides
- ⁶ Mercury and other metals
- ⁷ Dioxins and furans
- ⁸ Mercury, PCBs, mirex/photomirex, pesticides, chlorinated phenols and chlorinated benzenes
- ⁹ Polynuclear aromatic hydrocarbons (PAHs)